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# FURTHER NOTES ON SOME APPENDICULARIANS FROM THE EASTERN PACIFIC

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## FURTHER NOTES ON SOME APPENDICULARIANS FROM THE EASTERN PACIFIC<sup>1)2)</sup>

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*With 10 Text-figures*

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This is the second taxonomic note on appendicularians collected by and stored in the laboratory of the Scripps Institution of Oceanography. After the manuscript of my paper, "Two new appendicularians from the Eastern Pacific, with notes on the morphology of *Fritillaria aequatorialis* and *Tectillaria fertilis*" (TOKIOKA, 1957) had been sent to the editor of the Transactions of the American Microscopical Society, the examination of the plankton samples collected by Shellback and Equapac Expeditions was continued for three months. During this time, I found a few more perfectly preserved specimens of *Fritillaria taeniogona* TOKIOKA and some sexually mature individuals of the form described under the name of *Fritillaria aequatorialis* LOHMANN in the paper mentioned above. Critical studies of these specimens made it clear that the former were related to the genus *Tectillaria* more closely than to the genus *Fritillaria*. The latter group differs distinctly from *Fritillaria aequatorialis* LOHMANN not only in the form of the tail, but also in the structure of the gonad, thus they belong to a new species, for which the name "*pacifica*" is proposed. In addition, the results of the detailed examination of *Fritillaria aberrans* LOHMANN and *Fritillaria magna* LOHMANN, both described rather insufficiently to this date, and short notes on *Folia gracilis* LOHMANN and *Megalocercus abyssorum* CHUN are given here. Among the morphological characteristics of *Fritillaria aberrans* and *Fritillaria magna* LOHMANN, it is most interesting that a circular muscle-like band is found in the anterior part of the pharynx, previously no muscular band has ever been observed on the trunk of any of the appendicularians.

Before going further, I wish to express my hearty thanks to members of the staff who granted me the favour of having a seat at Scripps Institution of Oceanography for a year, and especially to Prof. Martin W. JOHNSON for his kindness in providing facilities.

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- 1) Contribution from Scripps Institution of Oceanography, New Series.
  - 2) Contributions from the Seto Marine Biological Laboratory, No. 316.

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1. *Megalocercus abyssorum* CHUN, 1888

(Fig. 1)

CHUN, C. (1888): Die pelagische Tierwelt in grösseren Meerestiefen und ihre Beziehungen zu der Oberflächenfauna. Bibliotheca Zoologica, I (1), pp. 40-42.

SEELIGER, O. (1893-1911): BRONN's Klassen und Ordnungen des Tier-Reichs, III Supplement Tunicata I abt., pp. 138-139, Taf. I figs. 3-5.

LOHMANN, H. und BÜCKMANN, AD. (1926): Ergebn. Deutsch. Südpolar-Exped., Bd. 18 (Zool. Bd. 10).

LOHMANN, H. (1933-34): KÜKENTHAL u. KRUMBACH-Handbuch d. Zoologie, Bd. V, Zweite Hälfte Tunicata, p. 186, Figs. 64-3 and 149.

BERNARD, M. F. (1954): Bull. Société d'Hist. Nat. Afrique d. Nord, Tom. 45, pp. 344-347, 2 figs.

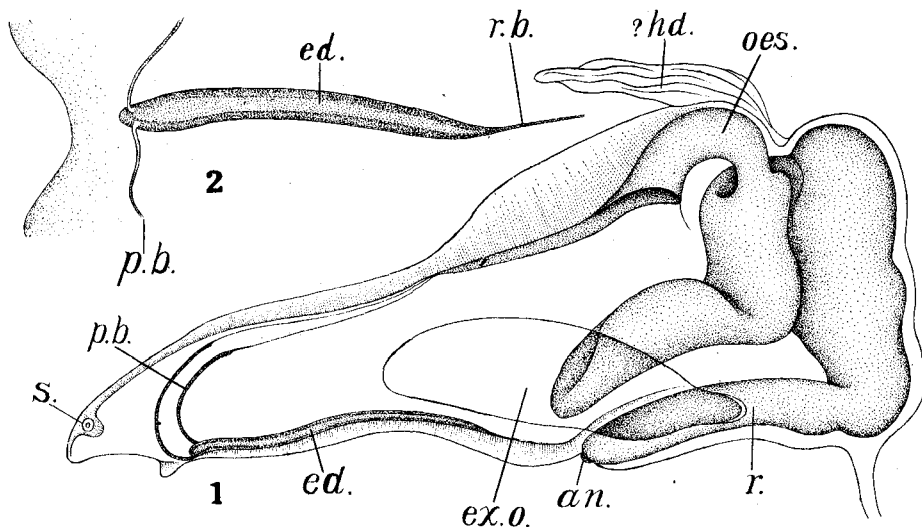


Fig. 1. *Megalocercus abyssorum* CHUN. 1—Left side of the 1.6 mm long trunk from MP-10. 2—Endostyle of the same specimen, dorsal side. *an.*...anus, *ed.*...endostyle, *ex.o.*...gill opening, *?hd.*...?hood, *oes.*...oesophagus, *p.b.*...peripharyngeal band, *r.*...rectum, *r.b.*...retropharyngeal band, *s.*...statocyst.

Two specimens found in the examined samples, and belonging to the genus *Megalocercus*, differ distinctly from *M. huxleyi* (RITTER) which is distributed very widely and commonly in the Pacific. They each have a strangely shaped left stomach-lobe with a striking elongate blind caecum at the antero-ventral angle, which projects forward along the dorsal side of the rectum (*r.*) as far as its distal end, reaching approximately the level of the anus (*an.*). The endostyle (*ed.*) is elongate and very slender; the gill openings (*ex.o.*) are very large and devoid of ciliated spiracles. The smaller of the two specimens has a hood-like appendage (*?hd.*) attached dorsally near the junction between the small right stomach-lobe and the rather voluminous intestine. It is not clear whether this is a natural structure or a piece of torn epidermis. The existence of a blind caecum at the antero-ventral edge of the left

stomach-lobe in these two specimens is so remarkable that they can't be considered as malformed individuals of *M. huxleyi*. It is much more natural to regard them as *M. abyssorum* CHUN. Both specimens are immature. The tail fin is quite wide and devoid of any gland cells. Measurements of these specimens are:

Specimen	Length of trunk	Length of tail	Locality	Haul depth
No. 1	1.6 mm	5.2 mm	Midpac 10 4°41.1'N 140°06.0'W	ca. 80 fathoms
No. 2	3.6 mm	14 mm	Shellback 145 ca. 12°S ca. 85°W	ca. 400 m - 0

*M. abyssorum* has only been reported from the waters around Italy and the Bay of Algeria. This is the first report of the species from other than the Mediterranean Sea.

## 2. *Folia gracilis* LOHMANN, 1892

(Fig. 2)

LOHMANN, H. (1892): Vorbericht über die Appendicularien der Plankton-Expedition. *Ergebn. Plankton-Exped.*, Bd. I, A, p. 147, Fig. 33.

*Folia aethiopica*—LOHMANN, H. (1892): *ibid*, Fig. 29.

LOHMANN H. (1896): *Ergebn. Plankton-Exped.*, Bd. II, E c, pp. 81-83, Pl. XIX.

*Folia gracilis*—LOHMANN, H. and BÜCKMANN, AD. (1926): *Ergebn. Deutsch. Südpolar-Exped.*, Bd. 18 (*Zool. Bd. 10*).

LOHMANN, H. (1931): *Deutsch. Tiefsee-Exped.*, Bd. XXI, Hft. 1.

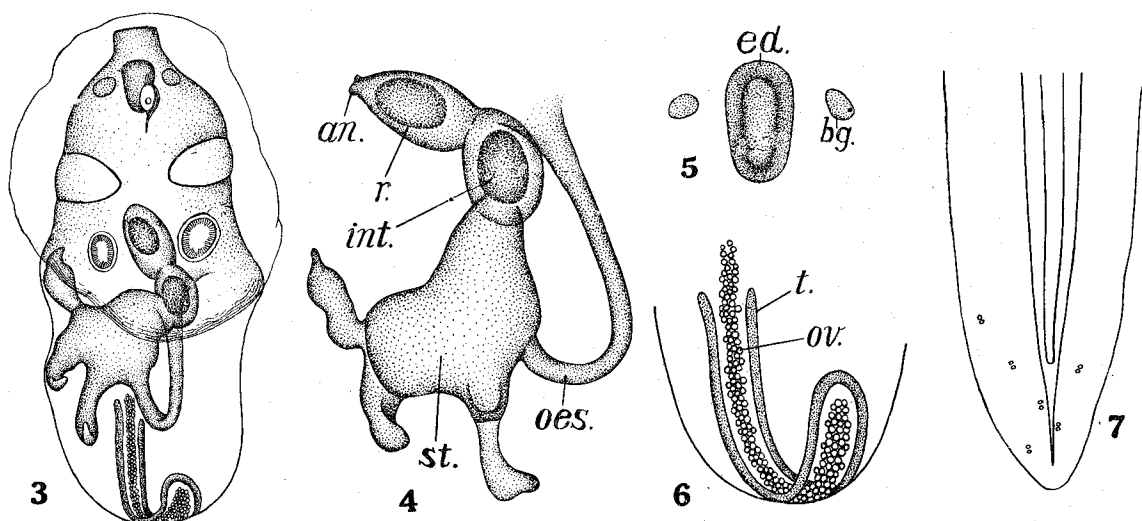


Fig. 2. *Folia gracilis* LOHMANN. 3—Dorsal side of the trunk,  $\times 127$ . 4—Dorsal side of the alimentary canal, enlarged. 5—Endostyle and buccal glands. 6—Dorsal sight of the gonad, enlarged. 7—Distal half of the tail. an....anus, bg....buccal gland, ed....endostyle, int....intestine, oes....oesophagus, ov....ovary, r....rectum, st....stomach, t....testis.

This species is already known from the Central Pacific, having been found in the plankton samples collected by Friedlich DAHL (1896-97) near the Bismarck-Archipelago (LOHMANN, 1931). I found a single small specimen in the sample taken at the Shellback station 142 (ca. 15°S × ca. 85°W, ca. 400 m—0). The trunk is 477  $\mu$  in length and the tail is 1625  $\mu$  long. The general structure of the trunk of the present specimen conforms well with that given by LOHMANN (1896), although there are some slight differences between LOHMANN's specimens and mine. The first is the existence of three remarkable glandular protuberances on the stomach of the Shellback specimen. The second is in the shape of the testis, which in the present specimen, is a thin string-like gland, situated on the mid-line of the posterior trunk and arranged as is shown in 6 of Fig. 2. The last is in the existence of several minute gland cells in the posterior part of the tail fin of the Shellback specimen. The posterior end of the chorda is a considerable distance from the posterior end of the musculature. The width of the chorda/the width of the musculature is 0.30-0.31 near the middle of the tail. All these differences are probably due to the condition of preservation or the degree of maturity. They don't appear to be valid as specific or racial characteristics differentiating the Shellback specimen from LOHMANN's specimens.

### 3. *Fritillaria aberrans* LOHMANN, 1896

(Figs. 3-5)

LOHMANN, H. (1896): Die Appendicularien der Plankton-Expedition. *Ergebn. Plankton-Exped.*, Bd. II, E c, pp. 36-37, Taf. V figs. 5 and 6.

*Fritillaria magna*—LOHMANN, H. (1896): *ibid.*, pp. 37-39, Taf. V figs. 4, 7-9.

*Fritillaria aberrans*+*Fritillaria magna*—LOHMANN, H. (1933): KÜENTHAL and KRUMBACH-*Handb. d. Zool.*, Bd. V, Zweite Hälfte Tunicata, Lief. 2, pp. 138-139, Fig. 126.

It seems to be necessary first to review the descriptions of *Fritillaria aberrans* LOHMANN and *Fritillaria magna* LOHMANN and to discuss the differences between these two species on the basis of previous data. The original descriptions were made from four specimens caught by the Plankton-Expedition, two of *F. magna* and two, in a very imperfect state of preservation, of *F. aberrans*. Subsequently, their names have appeared in some of the lists of appendicularians collected by various expeditions. No further morphological description has been given except for that of the tail musculature, which appeared in "Handbuch der Zoologie" (1933). Thus, the morphological details of these species are only rather imperfectly known. In the following table they are compared.

The differences between the two species may be summarized into four points: (1) the structure of the alimentary organs, (2) the appearance of the bottom wall of the pharynx between the spiracles, (3) the absence of "Nesselzellen"-like elements on the oikoplast-epithelium in *F. aberrans* and (4) the number and arrangement of muscle bands in the tail musculature.

I have found 49 specimens of a form of *Fritillaria*, which is referable to both

*F. aberrans*

Trunk	Exact shape unknown, genital portion is missing in all specimens studied. Hood is present. 1000-1390 $\mu$ long excluding the posterior genital portion.
Pharynx	Endostyle as in <i>F. magna</i> . Spiracles very long. A small sac-formed glandular organ present on the outer side of each spiracle? Bottom of pharynx between the spiracles is walled with two series of cells with distinct nuclei.
Oesophagus	
Stomach and Intestine	Large stomach is situated on the left and intestine and rectum on the right side. A number of spherical protruded cells are found on the stomach. A glandular appendage, a squashed bladderly vesicle, on each side of the intestine.
Gonad	
Oikoplast-epithelium	"Das Fehlen der Nesselzellen ähnlichen Elemente des Integuments."
Small gland cells	
Tail	Musculature consists of 10-14 muscle bands which are each distinctly discernible, but not separated from one another.

*F. magna*

	Elongate, at least in the individual with developed testis. Genital portion long; posterior end rounded. Hood well developed and terminating anteriorly in an obtuse end. Up to 5 mm in length.
	Endostyle is situated nearly in front of the oikoplast-epithelium and curled strongly to the dorsal side; its anterior terminal portion is much broader than the rest. Spiracles very long. A small elongate sac-formed glandular organ is present on the outer side of each spiracle, approximately at the middle of spiracles.
	Short, but thick.
	Large stomach occupies the whole dorsal side of the mass of the alimentary organs and is provided with a number of large spherical protruded cells in the younger specimen, but with a number of bundles of finger-shaped protuberances in the older individual. A cell group on each side of the intestine, consists of 3-4 cells, of which one is thickly walled and with somewhat brighter contents.
	Testis large and elliptical in shape. Ovary unknown.
	Consisting of many small follicular cells as in <i>F. fraudax</i> .
	Two pairs of gland cells on the dorsal side of the genital portion.
	Musculature of a medium width and consisting of 5-10 wide muscle bands which are 23-58 $\mu$ in breadth and slightly separated from one another. Fin is wide and ends posteriorly in a single pointed terminal.

of the species under discussion. Two were from Equapac samples, 2 from Midpac samples and 45 in the Shellback samples; the Shellback and Equapac samples were taken by oblique hauls generally between 400 m depth and the surface, the Midpac samples were from 400-600 m depth to the surface (MP-3 600-500 m, MP-7 220 fathoms). Many specimens were imperfectly preserved, but some retained portions of the body which were perfectly preserved. The following description of the form is synthesized:

*Trunk*: Elongate as in *F. haplostoma* FOL. The anterior portion of the trunk, in front of the stomach, is considerably longer than the posterior portion, behind the stomach, in immature individuals (65:42 in an individual from MP-3). The two portions are nearly equal in individuals with mature gonads (21:19 in a mature individual). Generally the trunk is broadest at attachment of the hood and narrowest just posterior to the stomach, the width/the length of the trunk varies from 0.26 to 0.8 in a 6.2 mm long individual from MP-3. A distinct hood is present; the shape of the upper lip is similar to that of *F. haplostoma*. The tip of the upper lip generally protrudes from the hood and is usually obtusely pointed, although it may be sharply acute as in an individual from MP-3, or rounded as in some specimens from the Shellback and Equapac samples. Sometimes the hood may be long enough to cover the whole upper lip. The posterior margin of the trunk is generally truncated, or rarely, narrowed and forming a pointed end. It is not certain whether such appearance is natural. The oiloplast-epithelium seems to cover the dorsal side of the distal half of the anterior portion of the trunk. A pair of very elongate spiracles are situated wholly beneath this epithelium. The endostyle is short and strongly curved upwards. A pair of large roundish gland cells are found behind the endostyle approximately at the level of the anterior end of the spiracles. A pair of minute gland cells are situated slightly posterior to the above-mentioned pair. A gland cell of medium size is located on the outer side and at about the middle of each spiracle.

The most remarkable characteristic is the existence of a muscle-like structure encircling the pharynx at about the center of the posterior half of the endostyle. The structure is rather delicate, but distinctly discernible by staining the specimens with Rose Bengal. Frequently it is found broken. At first, I thought it might be the peripharyngeal band, but its location clearly differs from that of the peripharyngeal band and moreover it faintly shows a structure which may be expressed as fibrous. I am inclined to consider this structure as a primitive circular muscle. So far as I am aware, there is no certain record of the existence of any muscle on the trunk of appendicularians, except for a fibrous structure found at the heart. In the late 19th century it was supposed that the epithelium of *Megalocercus abyssorum* was a kind of musculature (CHUN, 1888), but this was nothing but the misidentification of the imperfectly preserved oiloplast-epithelium as musculature. This may thus be the first time the existence of body musculature has been found in appendicularians with any considerable certainty. It is very desirable that more perfectly preserved specimens

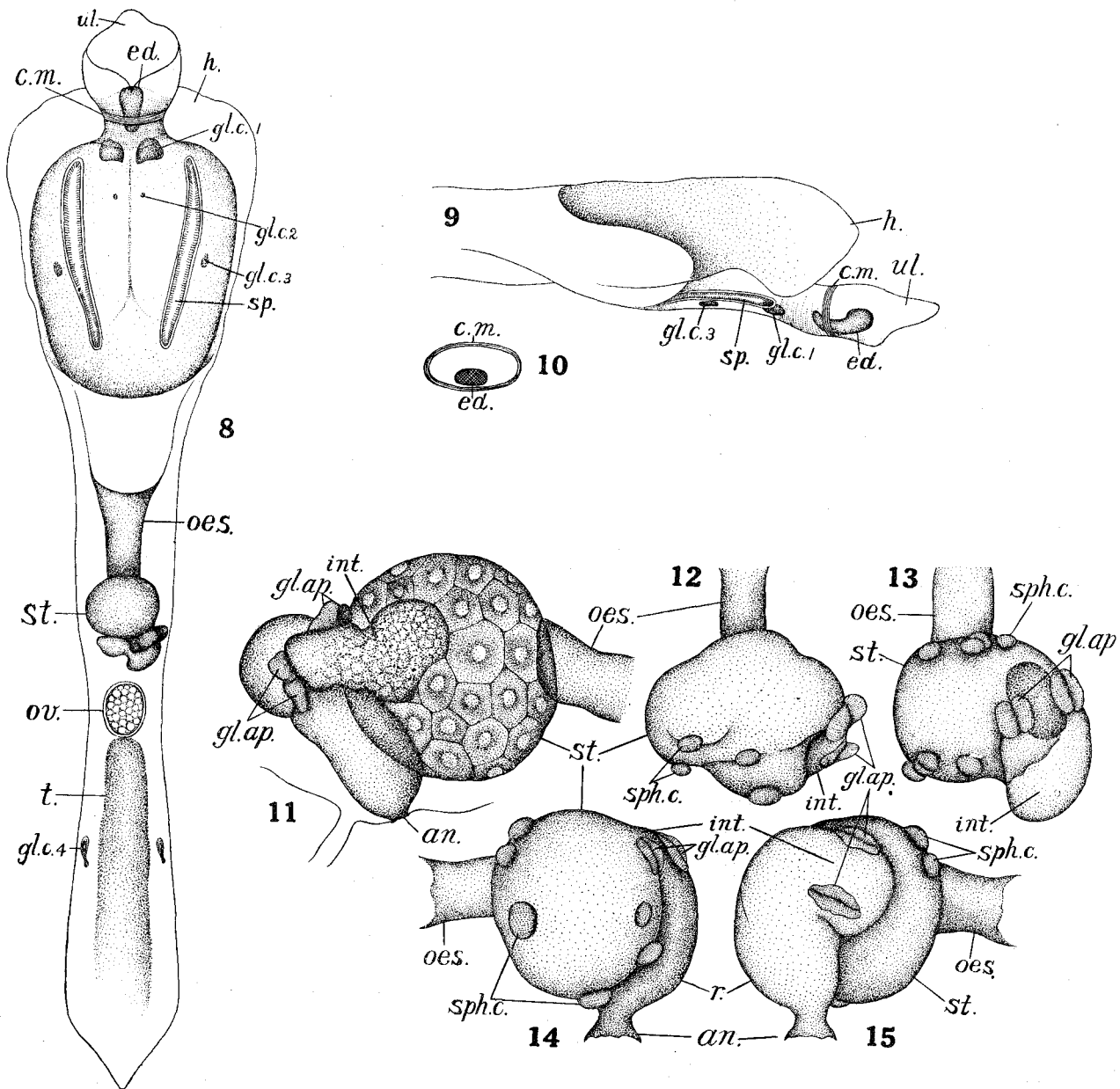


Fig. 3. *Fritillaria aberrans* LOHMANN. 8—Ventral side of the trunk. 9—Pharyngeal portion, right side. 10—Schematic representation of the section through the circular muscle. 11—Alimentary organ of an individual from MP-3, right side. 12—Alimentary organ of other specimen, dorsal side. 13—ditto, dorsal side. 14—ditto, left side. 15—Right side of the same alimentary organ. *an.*...anus, *c.m.*...circular muscle, *ed.*...endostyle, *glap.*...glandular appendage, *gl.c.1-4*...small gland cells, *h.*...hood, *int.*...intestine, *oes.*...oesophagus, *ov.*...ovary, *r.*...rectum, *sp.*...spiracle, *sph.c.*...spherical cells projecting out from the stomach wall, *st.*...stomach, *t.*...testis, *ul.*...upper lip.



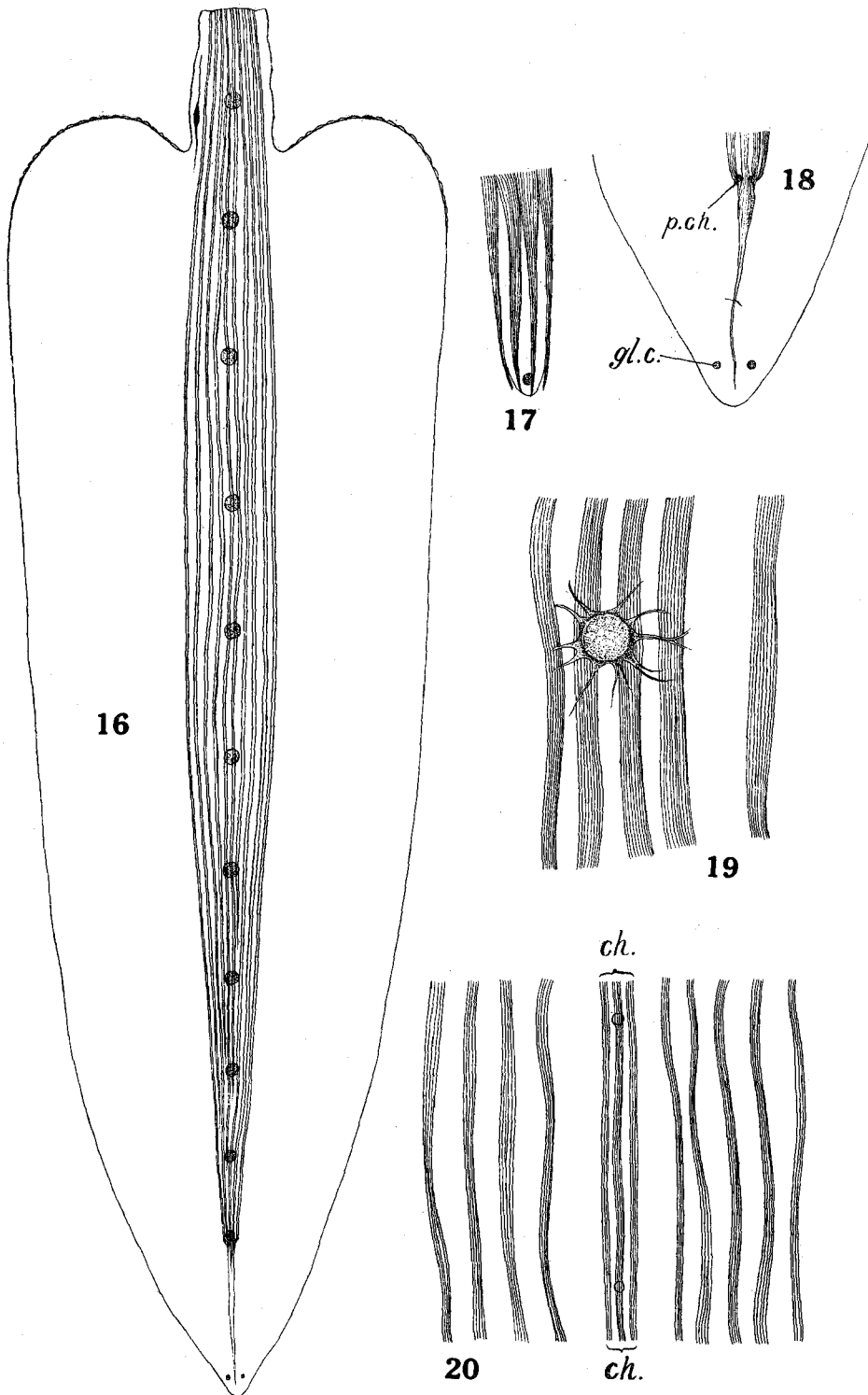


Fig. 4. *Fritillaria aberrans* LOHMANN. 16—Tail of an individual from MP-3,  $\times$  ca. 15. 17—Posterior end of the tail musculature, magnified. 18—Extension of a fine muscle band beyond the posterior end of the tail musculature, magnified. 19—A part of the tail musculature, showing a chordal nucleus,  $\times$  127. 20—Ditto, less magnified. *ch.*...chorda, *gl.c.*...gland cell, *p.ch.*...posterior end of chorda.

be carefully examined to confirm this structure, for the existence of circular musculature in the appendicularians may allude to the possibility of the existence of a certain direct relationship between this animal group and Thaliacea.

The oesophagus is thick, the stomach is spherical in shape with the intestine and rectum situated on its right posterior side. The relative positions of these organs is considerably variable, depending on the state of the preservation. Usually there are several (2-3 to 6-7) protruded spherical cells over the stomach surface. In some rare cases, however, none of these cells are found on the stomach, and its surface is nearly smooth. The stomach, in an individual from MP-3, was  $520\ \mu$  in diameter. Generally a pair of glandular appendages are found on the intestine as in *F. haplostoma*. They are usually squashed, or flattened so strongly that in some specimens they can hardly be detected. In many cases, the appendages are deeply depressed along their axes parallel to the intestine, leaving both sides highly elevated, so that they look as if they each consist of two laminae. In two of the specimens examined, each glandular appendage appears to consist of two cells. It is not clear, however, whether they really consist of two cells or a single cell which is strongly folded into two swollen laminae. More critical examination of perfectly preserved specimens is necessary before a definite description of the structure of the glandular appendage can be given.

Gonads were found in a single individual from MP-3. The ovary was an oval mass located just behind the stomach and the testis seems to form an elongate mass as in *F. haplostoma*. An elongate gland cell is present on each side of the testis near its middle (*gl. c. 4*).

Measurements of representative specimens are:

Source	Length of trunk	Length of tail	C/M $\times$ 100
SB - 112	3.3 mm	8.5 mm	43.3
SB - 112	2.6 mm (anterior portion)	8.1 mm	
SB - 180	4.9 mm	8.5 mm	
MP - 3	6.2 mm	12.5 mm	

Tail: The largest tail was 13 mm in length. The musculature is of moderate width and consists of 10-12 (most frequently 10) muscle bands on one surface, in the present material. Generally speaking, the muscle bands touch one another in younger specimens, while they are separated from one another in fully grown individuals. Near the posterior end the musculature consists of 4 muscle bands on one surface and terminates just at the posterior end of the chorda. In some specimens, however, these four muscle bands extended posteriorly beyond the distal end of the chorda, and unite into two thin bands which then fuse into a single fine band. The width of the chorda/the width of the musculature is rather large ( $2/3$  in an individual from MP-3) in younger specimens, but it decreases remarkably in fully grown individuals, in which the muscle bands are widely separated. The ratio is only  $1/7-1/9$  in an individual from SB-115. The chorda is covered on each surface by 3-4

muscle bands and provided with 11 roundish chordal nuclei in a specimen from MP-3. The fin is rather wide, ending posteriorly in a single acute tip as in *F. haplostoma*. The margin along the shoulder-like antero-lateral angles is ciliated. Only a small pair of gland cells, near the posterior end, is observed on the surface of the fin. The 12.5 mm long tail, of an individual from MP-3, is broadest at the level of the shoulder-like antero-lateral angles ( $\text{width/length}=0.32$ ). The musculature is widest ( $780\ \mu$ ) slightly anterior to the middle of the fin.

The above-mentioned form appears to resemble both *F. aberrans* and *F. magna*. It most likely combines these two species into a single one. The first of the four differences between *aberrans* and *magna*, the differences found in the structure of

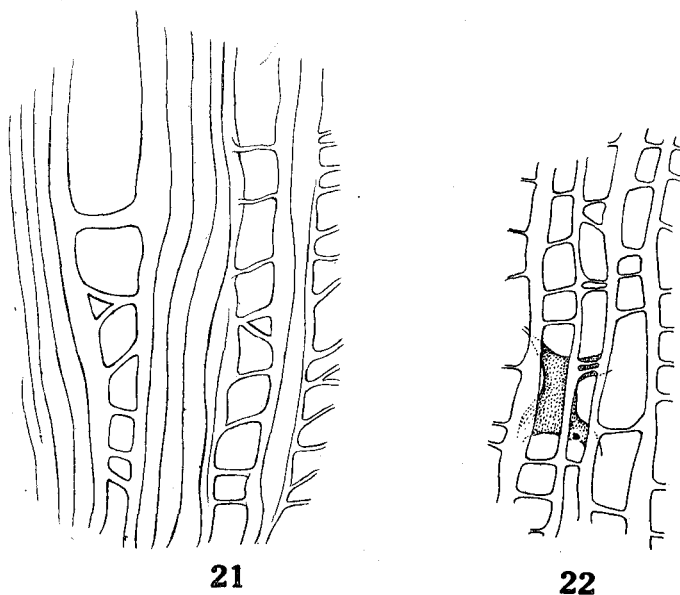


Fig. 5. *Fritillaria fraudax* LOHMANN. 21-22—Parts of the tail musculature of an old, fully grown individual, magnified.

the alimentary organs, is rather variable in the present form. LOHMANN's *magna* has 3-4 cells instead of the single glandular appendage of intestine as in *aberrans*. It is, however, very possible that one of these 3-4 cells, which is thickly walled and with somewhat clear contents, may represent the glandular appendage and other 2-3 cells belong to the spherical protruded cells which are found scattered over the stomach surface. The fact that LOHMANN's original specimens of these two species, especially of *aberrans*, were in a very unsatisfactory condition, seems to decrease considerably the validity of the above-mentioned distinction. The second and the third of the differences are evidently due to the state of preservation. The last of the four differences, the number and arrangement of muscle bands of tail musculature, are quite continuous between *aberrans* and *magna*. It appears that they vary with age,

condition of preservation and even individually. The liberation of respective muscle bands is not confined to this "Formenkreis", but also it can be seen in other species. A part of the tail musculature of an old fully grown individual of *F. fraudax* LOHMANN, from SB-60, is shown as an example (Fig. 5).

Throughout above-mentioned discussions, I am inclined to believe that *F. aberrans* and *F. magna* are identical, and the name *F. aberrans* should be reserved according to the law of the page priority.

#### 4. *Fritillaria pacifica* n. sp.

(Figs. 6-9)

*Fritillaria aequatorialis*—TOKIOKA, T. (1957): Two new appendicularians from the Eastern Pacific, with notes on the morphology of *Fritillaria aequatorialis* and *Tectillaria fertilis*. Trans. American Microscop. Soc., Vol. LXXVI, No. 4, pp. 364-365, Figs. 3C, 4 D-E.

Forty-one specimens in all have been examined, 26 from Equapac material and 15 from Shellback material. When I described the morphology of the tail of this form (TOKIOKA, 1957), I had no specimens with any trace of gonads. The identification was made on the most perfectly preserved specimen from SB-10, which is shown here in Fig. 6. The trunk was 1510  $\mu$  in length and somewhat elongate in outline. The genital portion (empty in this specimen), posterior to the alimentary organ, was about half as long as the anterior portion in front of the stomach, which was much more spacious than the genital part. The mouth closely resembles that of *Fritillaria fraudax* LOHMANN (Fig. 9) and is wholly covered by the hood. The oikoplast-epithelium consists of two pairs of elongate elliptical cell groups and is bordered by six large cells along the posterior margin. The endostyle is very markedly curved. The spiracles are rather large and elliptical in outline. The ciliated dorsal lamina can be traced to near the mid point between the posterior end of the endostyle and the oesophageal opening where it becomes quite obscure.

The oesophagus is very long and the stomach is comparatively small, oval in outline and rather smooth walled. The intestine and rectum are situated at the right posterior side of the stomach. There are a pair of distinct roundish glandular appendages on the intestine as found in many species belonging to the subgenus *Eurycerus*. Two additional thin wing-shaped horizontally placed glandular appendages are located at the posterior end of the intestine. In some specimens, a few small spherical cells project from the general contour of the intestine. The wing-shaped glandular appendages consist of a ventral appendage located on the median line of the trunk and a dorsal one slightly displaced to the left. In some mature specimens, the appendages are found detached from the surface of the alimentary organ. The heart is very prominent and somewhat displaced to the left side of the ventro-median line.

The above-mentioned features of the trunk, especially the relative smallness of

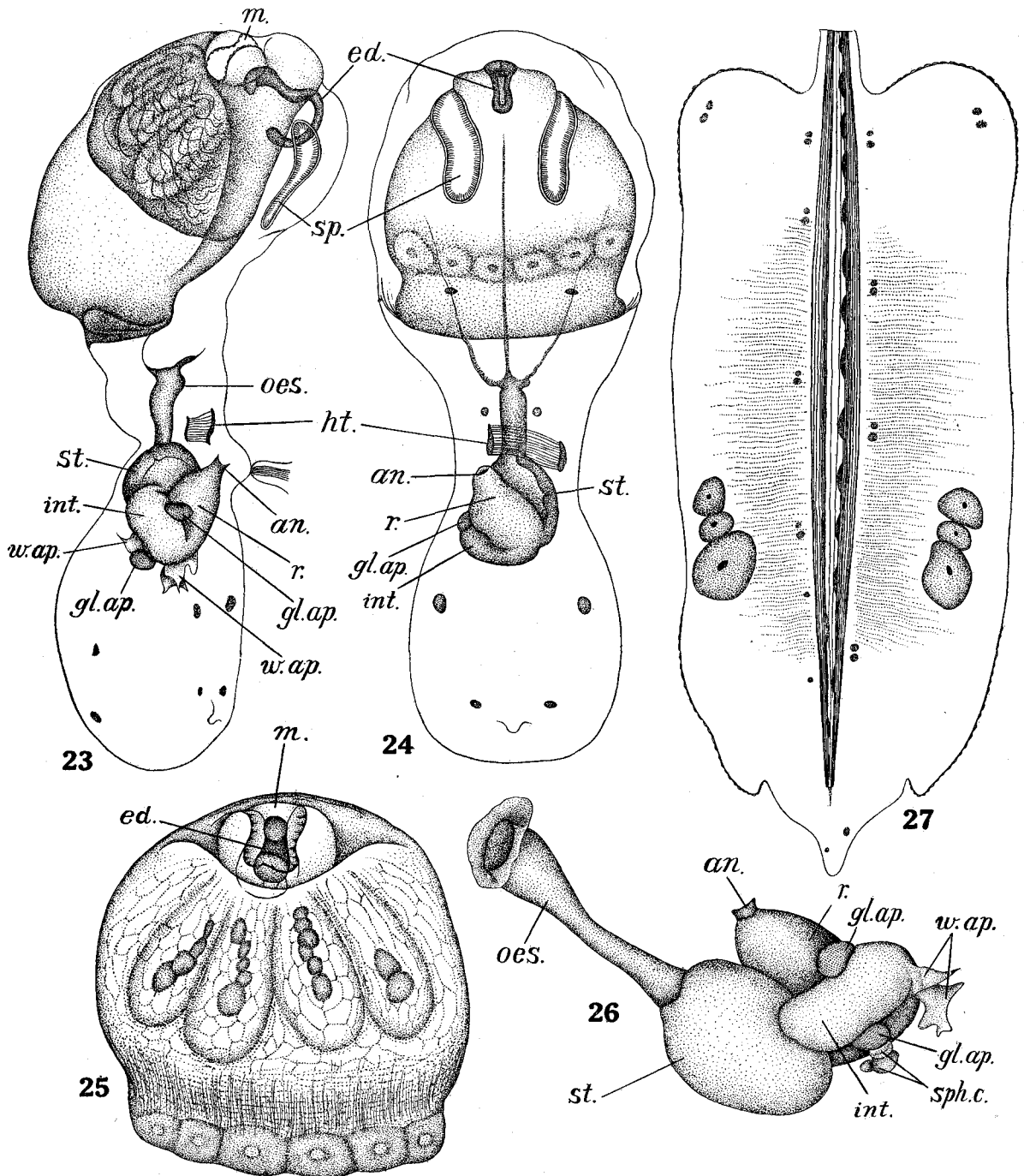


Fig. 6. *Fritillaria pacifica* n. sp. 23—Right side of the trunk. 24—Ventral side of the trunk. 25—Oikoplast-epithelium, dorsal side. 26—Alimentary organ, dorsal. 27—Tail. an...anus, ed...endostyle, gl.ap...glandular appendage, ht...heart, int...intestine, m...mouth, oes...oesophagus, r...rectum, sp...spiracle, sph.c...spherical cell projecting out from the stomach surface, st...stomach, w.ap...wing-shaped membranous glandular appendage.

the genital portion, compared with the spacious pharyngeal part and the general appearance of the alimentary organ, resemble so closely those of *Fritillaria aequatorialis* LOHMANN, described and figured in 1896, that I dared to identify my specimen as *F. aequatorialis*. This was in spite of the distinct difference in the structure of the tail for I thought LOHMANN's description of the tail of *F. aequatorialis* might have been made on some imperfectly preserved specimens. Later, however, I found a single specimen with fully mature gonad in the sample from SB-55 (Fig. 7). The gonad of this specimen consisted of the string-formed ovary and a somewhat membranous testis, whose lateral sides were curled upwards. This structure of the testis apparently differs from that of *F. aequatorialis* which has "ein eiförmiger, voluminöser Hoden, mit seiner Längsachse schräg von vorn unten nach hinten und oben gerichtet".

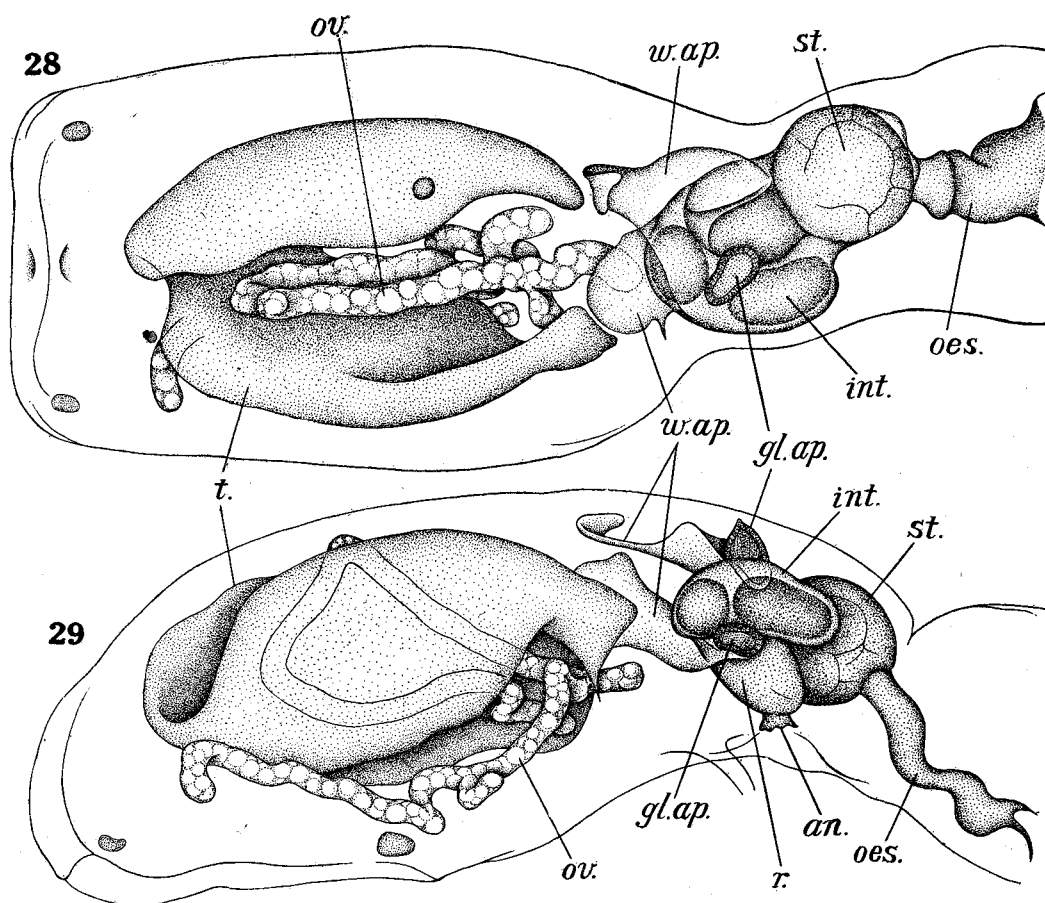


Fig. 7. *Fritillaria pacifica* n. sp., an individual with fully matured gonad, SB-55. 28—Dorsal side of the posterior half of the trunk. 29—Right side of the same portion. an....anus, gl.ap....glandular appendage, int....intestine, oes....oesophagus, ov....ovary, r....rectum, st....stomach, t....testis, w.sp....wing-shaped membranous glandular appendage.

The ovary of *F. aequatorialis* is also string-shaped as indicated in the original description—"Ihn (the testis) umgeben rechts und links in der Form eines Gürtels je 1 wurmförmigen Ovarialstrang, der bei älteren Thieren Rosenkranz-ähnliche Einschnürungen in Eifächer zeigt". The ovary and the testis were arranged so complicatedly or rather irregularly in the specimen from SB-55, I could find no definite

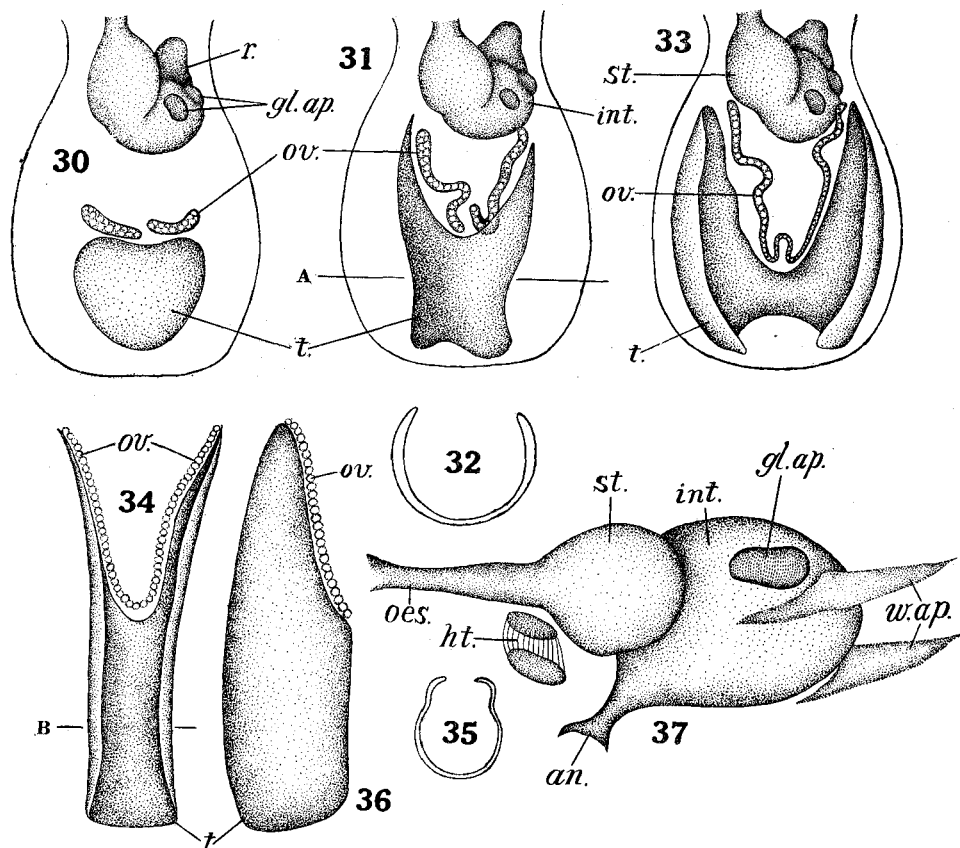


Fig. 8. *Fritillaria pacifica* n. sp., gonads and alimentary organ shown somewhat schematically. 30, 31, 33—Three stages of the successive development of the gonad. 32—Transverse section through the line A of the testis shown in 31. 34—Gonad of an individual from SB-137, dorsal. 35—Transverse section through the line B of the testis shown in 34. 36—Left side of the same testis. 37—Left side of the alimentary organ, shown somewhat schematically. an...anus, gl.ap...glandular appendage, ht...heart, int...intestine, oes...oesophagus, ov...ovary, r...rectum, st...stomach, t...testis, w.ap...wing-shaped membranous glandular appendage.

difference between the gonads of respective forms until specimens with gonads in various stages of development were found in samples of the Equapac Expedition. By examining these specimens in detail, it is definitely established that the structure of the gonad of the present questionable form differs distinctly from that of *F. aequatorialis*. The structure of the gonad is shown in Fig. 8.

In earlier stages, the testis forms a semicircular disc placed horizontally with a convex posterior margin and a truncate anterior edge. The ovaries are represented by two sausage-shaped pieces situated along the anterior margin of the testis. The lateral sides of the testis extend gradually towards the anterior and dorsal side, thus finally it grows up to a laminary mass curled up to the dorsal side along the lateral margins. Its anterior margin is remarkably concave. The ovaries of both sides become longer along the concave anterior margin of the testis and are usually found united in fully mature gonads.

It is clear that the specimens treated here represent a new species distinctly differentiated from any known species of *Fritillaria*. The specific name "*pacifica*" is proposed here for this new species, whose most striking characteristics are the unique shape of the tail and the structure of the gonad.

Finally a short note is given on the distribution of small gland cells throughout the trunk (Fig. 9). There is a small cell on each side of the mouth; two pairs of cells are found in the pharyngeal portion, one near the level of the anterior end of the spiracles and the other at the level near the posterior end of the oiloplast-epithelium. There is a small cell on each side of the oesophagus near its anterior margin, and a single cell near the right dorsal side of the cardiac end of the stomach. Three pairs of cells are found in the genital portion, two on the dorsal side and one along the posterior margin of the trunk. Some of these small gland cells often may be missing.

Measurements :

Source	Length of trunk	Width of trunk	Length of tail	Width of tail
EQP-H 17	1192 $\mu$	540 $\mu$	1950 $\mu$	870 $\mu$
EQP-H 17	1340 $\mu$		2170 $\mu$	910 $\mu$
EQP-H 17	1340 $\mu$		2170 $\mu$	975 $\mu$
SB 10	1510 $\mu$		2275 $\mu$	870 $\mu$
SB 55	1730 $\mu$			

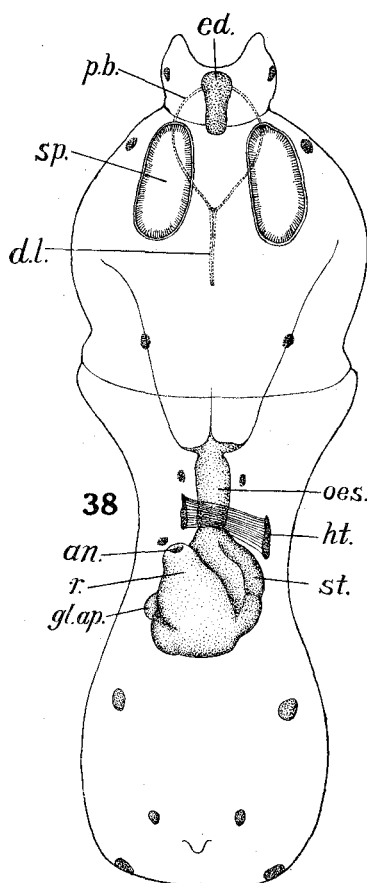


Fig. 9 (38). *Fritillaria pacifica* n. sp. Distribution of small gland cells on the trunk, ventral. *an.*...anus, *d.l.*...dorsal lamina, *ed.*...endostyle, *gl.ap.*...glandular appendage, *ht.*...heart, *oes.*...oesophagus, *p.b.*...peripharyngeal band, *r.*...rectum, *sp.*...spiracle, *st.*...stomach.



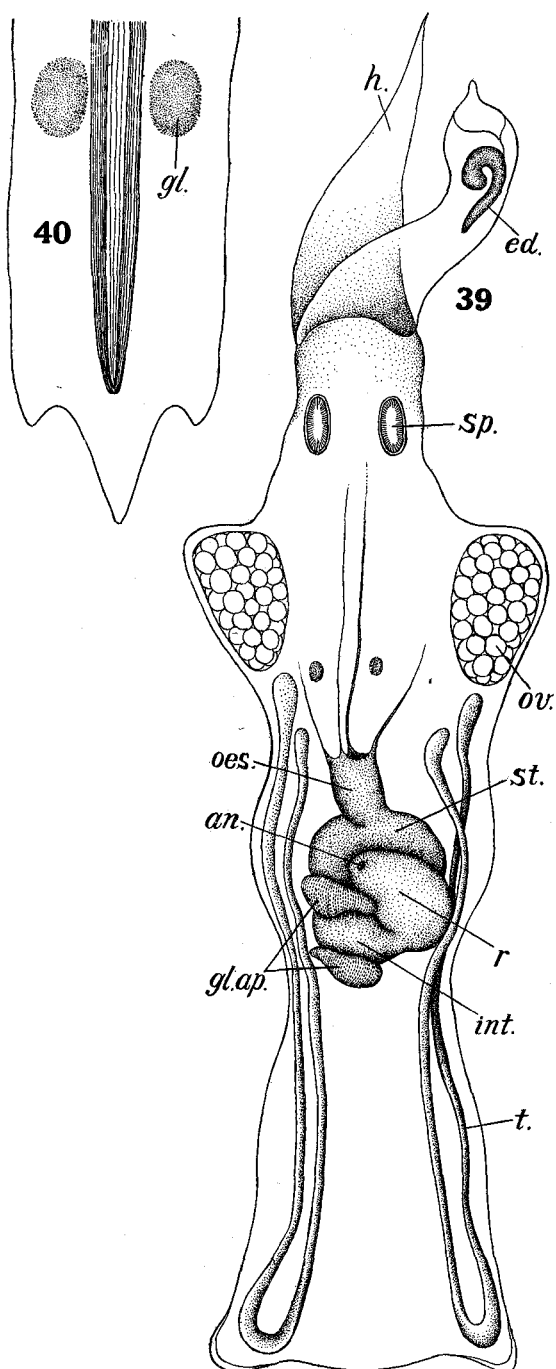


Fig. 10. *Tectillaria taeniogona* (TOKIOKA). 39—Ventral side of the trunk. 40—Distal half of the tail. *an.*...anus, *ed.*...endostyle, *gl.*...glandular tissue, *gl.ap.*...glandular appendage, *h.*...hood, *int.*...intestine, *oes.*...oesophagus, *ov.*...ovary, *r.*...rectum, *sp.*...spiracle, *st.*...stomach, *t.*...testis.

Mature specimens of *F. aequatorialis* from the Plankton Expedition are 600–700  $\mu$  in trunk length, much smaller than *F. pacifica*.

### 5. *Tectillaria taeniogona* (TOKIOKA), 1957

(Fig. 10)

*Fritillaria taeniogona*—TOKIOKA, T. (1957): Two new appendicularians from the Eastern Pacific, with notes on the morphology of *Fritillaria aequatorialis* and *Tectillaria fertilis*. Trans. American Microscop. Soc., Vol. LXXVI, No. 4, pp. 363–364, Figs. 3A and B.

A comparatively well preserved specimen was found in the plankton sample from SB-187. The shape of the mouth part resembles somewhat that of *F. haplostoma*, the upper lip being obtusely pointed at the anterior end. Spiracles are comparatively small and elliptical in outline. A pair of small gland cells are present on the pharyngeal wall at the level slightly in front of the anterior end of the oesophagus. The intestine and rectum are situated on the right or right posterior side of the stomach. A very distinct pair of glandular appendages are found on the intestine. They are stained purplish red by Rose Bengal, while the intestinal wall is stained red orange by the same dye. A pair of ovaries are found near the middle of the area between the spiracles and the oesophagus.

The posterior end of the tail fin is pointed and there is a pair of subterminal notches near the distal end, somewhat posterior to the termination of the tail musculature. A vague glandular tissue, roughly round in outline, is faintly observed on each side of the tail musculature, approximately a quarter of the way from the distal end of the tail. Although the exact structure of the oiloplast-epithelium is not yet known for the present species, the above-mentioned structures of both trunk and tail make it reasonable that the present specimen should belong to the genus *Tectillaria* rather than to *Fritillaria*. The genus *Tectillaria* thus acquires here its second member.

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